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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,824	07/03/2003	Andrej S. Mitrovic	071469-0303425	3907

909 7590 10/14/2004

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EXAMINER	
DEB, ANJAN K	

ART UNIT	PAPER NUMBER
2858	

DATE MAILED: 10/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/612,824	MITROVIC ET AL.	
	Examiner	Art Unit	
	Anjan K Deb	2858	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *07/03/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 9-11 are rejected under 35 U.S.C. 102(b) as being anticipated by Suemasa et al. (US 6,089,181).

Re claims 1, 9, 10, Suemasa et al. discloses method and device (Fig. 1) comprising providing radio frequency electrical signal to plasma drive electrode 110 at a fundamental frequency (low frequency component)(column 4 lines 54-61) to plasma drive electrode and providing a supplemental signal (high frequency component), having controlled phase relationship with the fundamental frequency controlled separately from the radio frequency electrical signal (column 5 lines 14-24) at a frequency harmonic to the fundamental frequency. High frequency component disclosed by Suemasa et al. is broadly interpreted as being a harmonic frequency of fundamental frequency (low frequency component).

Re claim 11, Suemasa et al. disclose phase shifter controlled by a phase controller to adjust the phase of the supplemental signal relative to the fundamental frequency electrical signal (modulator 152 for adjusting phase is broadly interpreted as phase controller)(column 5 lines 22-25).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 2-8, 12, are rejected under 35 U.S.C. 103(a) as being unpatentable over Suemasa et al. (US 6,089,181) in view of Miller et al. (US 5,325,019).

Re claims 2-5, Suemasa et al. discloses all of the claimed limitations as set forth above except supplemental signal comprises plurality of signals, each being at a frequency harmonic to the fundamental frequency and in phase with the fundamental frequency.

Miller et al. discloses control of plasma process by use of harmonic frequency components of voltage and current (see title) wherein knowledge of electrical characteristics of the fundamental and harmonic frequency response of the particular plasma in the reactor is used for selecting an operative point for a particular semiconductor process. Etch rate is broadly interpreted as a parameter in a particular semiconductor process (column 8 lines 24-32).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. by adding supplemental signal comprising plurality of signals, each being at a frequency harmonic to the fundamental frequency disclosed by Miller et al. for controlling a particular semiconductor process.

Re claims 6-8, Suemasa et al. as modified by Miller discloses all of the claimed limitations as set forth above including determining phase difference and controlling RF and supplemental signal (low and high frequency components)(column 5 lines 12-24), for controlling plasma for controlling a particular semiconductor process including etch rate (column 7 lines 10-22), uniformity of etch or deposition rate (column 8 lines 28-32).

Re claim 8, Suemasa et al. as modified by Miller did not expressly disclose selecting plasma parameters from the group consisting selectivity of the etch of one material relative to the etch of another material, the uniformity of the selectivity, feature profile (or anisotropy), the uniformity of the feature profile, deposited film stress, and the uniformity of the deposited film stress.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. and Miller by including all of the claimed plasma parameters as required for controlling a particular semiconductor process.

Re claim 12, Suemasa et al. disclose first and second branch (connected to source 140,148), amplifier 142,150, phase shifter (modulator 152), and combination node (Fig. 1).

Suemasa et al. did not expressly disclose voltage-current probe disposed between combination node and plasma electrode to measure combined signal properties, and system monitor in electrical communication with at least one branch of the device to monitor the device but would have been obvious for doing so because Suemasa et al. disclose using specific frequencies and RF power for controlling plasma etching (column 8 lines 24-45).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. by adding voltage-current probe and monitor for controlling RF power input to plasma apparatus for controlling plasma etching.

5. Claims 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suemasa et al. (US 6,089,181), in view of Miller et al. (US 5,325,019) and further in view of Yoshizako et al. (US 5,844,369).

Re claims 13,16, Suemasa et al. and Miller et al. disclose all of the claimed limitations as set forth above except clock and plurality of dividing circuits.

Yoshizako discloses plurality of divider circuits (waveform synthesizing circuits 42, 43) and clock 41 for controlling plasma process.

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. and Miller et al. by adding plurality of divider circuits and clock disclosed by Yoshizako for controlling plasma process.

Re claims 14, 15 Suemasa et al. and Miller disclose first and second branch (connected to source 140,148), amplifiers (142,150), phase shifter (modulator 152), and combination node (Fig. 1). Miller et al. also disclosed current 18 and voltage probe 17 (Fig. 2).

Suemasa et al. and Miller et al. did not expressly disclose voltage-current probe disposed between combination node and plasma electrode to measure combined signal properties, and system monitor in electrical communication with at least one branch of the device to monitor the

device but would have been obvious for doing so because Suemasa et al. disclose using specific frequencies and RF power for controlling plasma etching (column 8 lines 24-45).

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. by adding voltage and current probe disclosed by Miller et al. and a monitor for controlling RF power input to plasma apparatus for controlling plasma etching.

Re claim 17, Suemasa et al. and Miller dislose all of the claimed limitations as set forth above including plurality of match networks (144,156) but did not expressly disclose plurality of phase shifters. However, it would have been obvious for having plurality of phase shifters for controlling RF power of supplemental signal having plurality of harmonic frequencies. [see MPEP 2144.04: Duplication of Parts. In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) (mere duplication of parts has no patentable significance unless a new and unexpected result is produced.)].

At the time of the invention it would have been obvious for one of ordinary skill in the art to modify Suemasa et al. by adding plurality of phase shifters for controlling RF power of supplemental signal having plurality of harmonic frequencies.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hopkins (US 5,808,415) discloses plasma apparatus and probe for sensing RF current comprising programmed frequency generator 81, frequency division and clock.

Klick (US 5,705,931) discloses probe for determining plasma parameters.

Sakamoto (US 5698062) discloses plasma apparatus and method including frequency divider and plasma probe.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Anjan K. Deb whose telephone number is 571-272-2228. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, N. Le, can be reached at (571) 272-2233.

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10/13/04

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